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| EXAMINER | |
|---|---|
| QUIETT, CARRAMAH J | |
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| 2622 | |

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Please find below and/or attached an Office communication concerning this application or proceeding.

PTO-90C (Rev. 10/03)

| Office Action Summary | Application No. | Applicant(s) | |
|---|---|---|---|
| | 10/052,020 | CAHILL ET AL. | |
| | Examiner | Art Unit | |
| | Carramah J. Quiett | 2622 | |

*-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --*

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

1)☒ Responsive to communication(s) filed on *10 February 2006*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

4)☒ Claim(s) *1-12,23-32,35 and 36* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-12,23-32,35 and 36* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

**Application Papers**

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *17 January 2002* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

1) ☐ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.

4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .

5) ☐ Notice of Informal Patent Application (PTO-152)

6) ☐ Other: _____.

## DETAILED ACTION

### *Continued Examination Under 37 CFR 1.114*

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 02/10/2006 has been entered.

### *Response to Amendment*

2. The amendment(s), filed on 01/10/2006, have been entered and made of record. Claims 1-12, 23-32, and 35-36 are pending.

### *Response to Arguments*

3. Applicant's arguments with respect to claims 1-12, 23-32, and 35-36 have been considered but are moot in view of the new ground(s) of rejection.

### *Claim Objections*

4. Claim 24 is objected to because of the following informalities: Since the Applicant has omitted steps "(a) and (b)" from claim 23, step "(c)" should be omitted from claim 24 as well. Please note that the Examiner is not referring to the contents or the limitations of the steps, but the symbols, which represent the steps. Appropriate correction is required.

### *Claim Rejections - 35 USC § 103*

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

6. **Claims 1-10 and 30-31** are rejected under 35 U.S.C. 103(a) as being unpatentable over Carlson (U.S. Pat. #4,554,585) in view of Hsieh et al. (U.S. Pat. #6,798,923).

For **claim 1**, Carlson teaches an electronic imaging system (fig. 1, 100, 110, 108) for capturing an image of a scene (col. 2, lines 57-62), said imaging system comprising:

(a) an optical system (fig. 1, 100) for producing an optical image of the scene (col. 2, line 63 – col. 3, line 10);

(b) an imaging sensor (solid-state imager, col. 2, lines 63-65) having a surface in optical communication (col. 2, line 66 – col. 3, line 2) with the optical system; and

(c) a plurality of imaging elements (fig. 2a) distributed on the surface of the imaging sensor (col. 4, lines 13-23), said imaging elements converting the optical image into a corresponding output image (fig. 1, ref. 106; col. 3, lines 4-7), said imaging elements being located according to a distribution representable by a nonlinear function in which the relative density of the distributed imaging elements is greater toward the center of the sensor (col. 4, lines 28-33), wherein the distribution provides physical coordinates for each of the imaging elements corresponding to a projection of the scene onto a non-planar surface (col. 4, lines 24-28); wherein said output image has a plurality of pixels (inherently – CCD; col. 2, line 63 – col. 3,

line 7), each said pixel corresponding to a respective one of said imaging elements (col. 4, lines 13-23);

wherein said optical system provides a perspective (wide field of view) projection of said optical image onto said surface (col. 2, line 63 – col. 3, line 7), said optical image produced by the optical system has a distortion relative to the surface of the imaging sensor and the distribution of imaging elements on that surface compensates for the distortion such that said output image is free of said distortion and has said pixels in a uniform rectilinear array. Please read Carlson's Abstract, col. 4, lines 24-28, and col. 5, line 14 – col. 6, line 9.

However, Carlson does not expressly teach that wherein said optical image has a perspective distortion relative to said surface, said perspective distortion being inherent in geometry of said perspective projection onto said surface, and said distribution of said imaging elements on said surface of said imaging sensor compensates said output image for said perspective distortion, such that said output image is free of said perspective distortion.

In a similar field of endeavor Hsieh teaches that said optical image has a perspective distortion relative to said surface (col. 3, line 64 – col. 4, line 1), said perspective distortion being inherent in geometry of said perspective projection onto said surface (col. 3, line 64 – col. 4, line 3), and said distribution of said imaging elements on said surface of said imaging sensor compensates said output image for said perspective distortion, such that said output image is free of said perspective distortion and has said pixels in a uniform rectilinear array (col. 3, line 64 – col. 4, line 40). In light of the teaching of Hsieh, it would have been obvious to one of ordinary skill in the art at the time the invention was made for Carlson to implement a system which

corrects perspective distortion in order to permit a predetermined mapping of the image onto the sensor.

For **claim 2**, Carlson, as modified by Hsieh, further discloses a system wherein the non-planar surface is inherently a cylinder. This is inherent because in col. 4, lines 28-33, Carlson states that the discrete picture elements 200 are symmetrically disposed about the center of a polar-coordinate spatial distribution pattern.

For **claim 3**, Carlson, as modified by Hsieh, further discloses a system wherein the non-planar surface is a sphere. This is inherent because in col. 4, lines 28-33, Carlson states that the discrete picture elements 200 are symmetrically disposed about the center of a polar-coordinate spatial distribution pattern.

For **claim 4**, Carlson, as modified by Hsieh, further discloses an optical system that includes a lens (Carlson, fig. 3, 304) and the axis of rotation of the cylinder intersects a nodal point of the lens. As stated before, it is inherent that Carlson's non-planar surface is a cylinder because in col. 4, lines 28-33, Carlson states that the discrete picture elements 200 are symmetrically disposed about the center of a polar-coordinate spatial distribution pattern. As illustrated in fig. 3 of Carlson, the center of the cylinder is located at a nodal point of the lens because the imager is located along the optical axis of the lens (col. 5, lines 13-19). The imager senses light from the lens via a low-pass filter (Carlson, col. 5, lines 26-29).

For **claim 5**, Carlson, as modified by Hsieh, further discloses a system wherein the optical system includes a lens and the center of the sphere is located at a nodal point of the lens. As stated before, it is inherent that Carlson's non-planar surface is a sphere because in col. 4, lines 28-33, Carlson states that the discrete picture elements 200 are symmetrically disposed

about the center of a polar-coordinate spatial distribution pattern. As illustrated in fig. 3 of Carlson, the center of the sphere is located at a nodal point of the lens because the imager is located along the optical axis of the lens (col. 5, lines 13-19). The imager senses light from the lens via a low-pass filter (Carlson, col. 5, lines 26-29).

For **claim 6**, Carlson does not expressly disclose a system wherein the radius of the cylinder is a function of a focal length of the optical system. However, in col. 4 lines 28-33, Carlson states that the discrete picture elements 200 are symmetrically disposed about the center of a polar-coordinate spatial distribution pattern. Additionally, in figure 2a, Carlson illustrates an image sensor where there are radial changes with respect to the high/low resolution periphery (col. 4, lines 24-42). The center of the cylindrical imager, which senses light from the lens via a low-pass filter (col. 5, lines 26-29), is located along the optical axis of the lens as illustrated in fig. 3 (col. 5, lines 13-19). In the same field of endeavor, Hsieh explains how to remove the effects of panoramic distortion of images projected on a cylinder (col. 3, line 65 – col. 4, line 40) by utilizing equations (1) – (4) to obtain coordinates for the corresponding pixel of the image plane in the cylindrical map. Since Hsieh states that the radius is equal to the focal length, the focal length will change with respect to the radius. In light of the teaching of Hsieh, it would have been obvious to one of ordinary skill in the art at the time the invention was made for Carlson to implement a system wherein the radius of the cylinder is a function of a focal length of the optical system in order to permit a predetermined mapping of the image onto the sensor.

For **claim 7**, Carlson does not expressly disclose a system wherein the radius of the sphere is a function of a focal length of the optical system. However, in col. 4 lines 28-33, Carlson states that the discrete picture elements 200 are symmetrically disposed about the center

of a polar-coordinate spatial distribution pattern. Additionally, in figure 2a, Carlson illustrates an image sensor where the radius changes with respect to the high/low resolution periphery (col. 4, lines 24-42). The center of the spherical imager, which senses light from the lens via a low-pass filter (col. 5, lines 26-29), is located along the optical axis of the lens as illustrated in fig. 3 (col. 5, lines 13-19). In the same field of endeavor, Hsieh explains how to remove the effects of panoramic distortion of images projected on a sphere (col. 3, line 65 – col. 4, line 40). Although, Hsieh gives an example of the cylindrical geometry, Carlson utilizes polar coordinates as explained in claim 3. Since Hsieh states that the radius is equal to the focal length, the focal length will change with respect to the radius. In light of the teaching of Hsieh, it would have been obvious to one of ordinary skill in the art at the time the invention was made for Carlson to implement a system wherein the radius of the sphere is a function of a focal length of the optical system in order to permit a predetermined mapping of the image onto the sensor.

For **claim 8**, Carlson, as modified by Hsieh, further discloses a system wherein the imaging sensor is a charge-coupled device (Carlson, col. 2, lines 63-65).

For **claim 9**, Carlson, as modified by Hsieh, does not specifically disclose a system wherein the imaging sensor is a CMOS device. However, in col. 2, lines 63-64, Carlson teaches that his imaging system includes a solid-state imager. Examiner takes Official Notice that it is well known in the art for a CMOS device to be a type of solid-state imager. It would have been obvious to one of ordinary skill in the art at the time the invention was made for Carlson to provide a system wherein the imaging sensor is a CMOS device in order to provide low-power consumption and to allow processing circuits to be integrated on the same substrate.

For **claim 10**, Carlson, as modified by Hsieh, further discloses a system wherein the output signal includes data from a plurality of images (Carlson, col. 2, lines 19-33).

For **claim 30**, Carlson discloses an electronic imaging system (Carlson, fig. 1, 100, 110, 108) comprising:

an optical system (fig. 1, 100) transmitting an optical image (Carlson, col. 2, line 63 – col. 3, line 10); and

a plurality of imaging elements (fig. 2a) having a distribution defining a plane (Carlson, col. 4, lines 13-23), said imaging elements receiving said optical image as a perspective projection onto said plane (col. 2, line 63 – col. 3, line 7), said imaging elements converting said optical image into a corresponding output image (col. 2, line 63 – col. 3, line 7), said distribution representing a nonlinear function corresponding to a projection of the scene onto a non-planar surface (col. 4, lines 24-33), said output image having a plurality of pixels (inherently – CCD; col. 2, line 63 – col. 3, line 7), each said pixel corresponding to a perspective one of said imaging elements (col. 4, lines 13-23); wherein said optical image has a distortion relative to said plane and said distribution of said imaging elements on said plane compensates for said distortion. Please read Carlson's Abstract, col. 4, lines 24-28, and col. 5, line 14 – col. 6, line 9.

However, Carlson does not expressly teach that wherein said optical image has a perspective distortion relative to said plane, said perspective distortion being inherent in geometry of said perspective projection onto said plane, and said distribution of said imaging elements on said plane compensates for said perspective distortion, such that said output image is free of said perspective distortion and has said pixels in a uniform rectilinear array.

In a similar field of endeavor Hsieh teaches that said optical image has a perspective distortion relative to said surface (col. 3, line 64 – col. 4, line 1), said perspective distortion being inherent in geometry of said perspective projection onto said surface (col. 3, line 64 – col. 4, line 3), and said distribution of said imaging elements on said surface of said imaging sensor compensates said output image for said perspective distortion, such that said output image is free of said perspective distortion and has said pixels in a uniform rectilinear array (col. 3, line 64 – col. 4, line 40). In light of the teaching of Hsieh, it would have been obvious to one of ordinary skill in the art at the time the invention was made for Carlson to implement a system which corrects perspective distortion in order to permit a predetermined mapping of the image onto the sensor.

For **claim 31**, Carlson, as modified by Hsieh, discloses the system wherein said imaging elements are linearly addressed (Carlson, col. 4, lines 13-42).

7. **Claims 11-12, 32, and 35-36** are rejected under 35 U.S.C. 103(a) as being unpatentable over Carlson (U.S. Pat. #4,554,585) in view of Hsieh et al. (U.S. Pat. #6,798,923) as applied to claims 10 and 30 above, and further in view of Ribera et al. (U.S. Pat. # 6,603,503).

For **claim 11**, Carlson, as modified by Hsieh, discloses a system with a moveable television camera that produces a video signal, which is coupled to an image signal processor. Carlson's image signal processor, which analyzes the image defined by the video signal to determine the exact whereabouts of a particular object in field of view, can inherently operate directly on the output signal without having to warp the image data (Carlson, col. 3, lines 33-46).

However, Carlson does not expressly teach a system including a processor for combining the images into a composite image.

In the same field of endeavor, Ribera discloses a system including a processor (Ribera, fig. 4, ref. 10) for combining the images into a composite image, thereby the processor can operate directly on the output signal without having to warp the image data (Ribera, col. 6, lines 10-21 and col. 4, lines 51-55). Similar to Ribera, Carlson's invention is related to wide view images (Carlson, col. 2, line 67 – col. 3, line 1). In light of the teaching of Ribera, it would have been obvious to one of ordinary skill in the art at the time the invention was made for Carlson to implement a system including a processor for combining the images into a composite image, thereby the processor can operate directly on the output signal without having to warp the image data in order to display panoramic images over a substantially 360 degree by 360 degree range of angles (Ribera, col. 1, lines 36-39).

For **claim 12**, Carlson, as modified by Hsieh, does not further disclose a system including a projector for projecting the composite image onto a planar surface. However, Ribera further discloses a system including a projector (Ribera, fig. 4, ref. 20) for projecting the composite image onto a planar surface (Ribera, col. 6, lines 10-21). Similar to Ribera, Carlson's invention is related to panoramic/wide view images (Carlson, col. 2, line 67 – col. 3, line 1). In light of the teaching of Ribera, it would have been obvious to one of ordinary skill in the art at the time the invention was made for Carlson to implement a system including a projector for projecting the composite image onto a planar surface in order to display panoramic images over a substantially 360 degree by 360 degree range of angles (Ribera, col. 1, lines 36-39).

For **claim 32**, Carlson discloses a system with a moveable television camera that produces a video signal, which is coupled to an image signal processor. Carlson's image signal processor, which analyzes the image defined by the video signal to determine the exact whereabouts of a particular object in field of view, can inherently operate directly on the output signal without having to warp the image data (col. 3, lines 33-46). However, Carlson does not teach a system further including a processor combining said output signal and one or more additional output signals into a composite image without warping.

In the same field of endeavor, Ribera discloses a system further including a processor (Ribera, fig. 4, ref. 10) combining said output signal and one or more additional output signals into a composite image without warping (Ribera, col. 6, lines 10-21 and col. 4, lines 51-55). Similar to Ribera, Carlson's invention is related to wide view images (Carlson, col. 2, line 67 – col. 3, line 1). In light of the teaching of Ribera, it would have been obvious to one of ordinary skill in the art at the time the invention was made for Carlson to implement a system further including a processor combining the output signal and one or more additional output signals into a composite image without warping in order to display panoramic images over a substantially 360 degree by 360 degree range of angles (Ribera, col. 1, lines 36-39).

For **claim 35**, Carlson teaches a method (fig. 1, 100, 110, 108) comprising:

receiving a perspective (wide field of view) projection of a scene onto a plurality of imaging elements defining a plane (col. 2, line 63 – col. 3, line 7), said projection having a distortion relative to said plane, said imaging elements being located in said plane according to a non-linear distribution representable by a projection of the scene onto a non-planar surface, said

distribution being compensatory of said distortion; Please read Carlson's Abstract, col. 4, lines 24-28, and col. 5, line 14 – col. 6, line 9; and

generating a digital image corresponding to said optical image using said imaging elements(col. 2, lines 63-65; col. 3, lines 4-7 and 47; col. 4, lines 28-33), said digital image having a plurality of pixels (inherently – CCD; col. 2, line 63 – col. 3, line 7), each said pixel corresponding to a respective one of said imaging elements (col. 4, lines 13-23), said pixels being in a uniform rectilinear array free of said perspective distortion. Please read Carlson's Abstract, col. 4, lines 24-28, and col. 5, line 14 – col. 6, line 9.

However Carlson does not expressly teach a method of generating a composite digital image, said method comprising:

said [a perspective] projection having a perspective distortion relative to said plane, said perspective distortion being inherent in geometry of said projection, said imaging elements being located in said plane according to a non-linear distribution representable by a projection of the scene onto a non-planar surface, said distribution being compensatory of said perspective distortion; and generating a digital image corresponding to said optical image using said imaging elements without further correction of said perspective distortion.

In a similar field of endeavor, Heish teaches a method wherein said projection having a perspective distortion relative to said plane (col. 3, line 64 – col. 4, line 1), said perspective distortion being inherent in geometry of said projection (col. 3, line 64 – col. 4, line 3), said distribution being compensatory of said perspective distortion (col. 3, line 64 – col. 4, line 40); and

In the same field of endeavor, Ribera teaches a method of generating a composite digital image generating a digital image corresponding to said optical image using said imaging elements without further correction of said perspective distortion (Ribera, col. 6, lines 10-21 and col. 4, lines 51-55). ). Similar to Ribera, Carlson's invention is related to wide view images (Carlson, col. 2, line 67 – col. 3, line 1). In light of the teaching of Ribera, it would have been obvious to one of ordinary skill in the art at the time the invention was made for Carlson to provide a method of generating a composite digital image generating a digital image corresponding to said optical image using said imaging elements without further correction of said perspective distortion in order to display panoramic images over a substantially 360 degree by 360 degree range of angles (Ribera, col. 1, lines 36-39).

For **claim 36**, Carlson, as modified by Hsieh and Ribera, teaches a method further including combining said digital image and one or more additional digital images into a composite image without warping (Ribera, col. 6, lines 10-21 and col. 4, lines 51-55).

8. **Claims 23-29** are rejected under 35 U.S.C. 103(a) as being unpatentable over Carlson (U.S. Pat. #4,554,585) in view of Hsieh et al. (U.S. Pat. #6,798,923) and Huang et al. ("Panoramic Stereo imaging System with Automatic Disparity Warping and Seaming," Graphical Models and image Processing, Vol. 60, No. 3, May 1998, pp. 196-208.)

For **claim 23**, Carlson teaches a method (fig. 1, 100, 110, 108) comprising:

providing a perspective (wide field of view) projection of each of said source optical images onto a planar surface (inherently) of an image sensor (col. 2, line 63 – col. 3, line 7),

wherein each of said source optical images has a distortion relative to said surface, said image sensor having a plurality of imaging elements, said imaging elements having a distribution on said surface compensatory for said distortion. Please read Carlson's Abstract, col. 4, lines 24-28, and col. 5, line 14 – col. 6, line 9:

generating at least two source digital images corresponding to said optical images said source digital images each having a plurality of pixels, each said pixel corresponding to a respective one of said imaging elements, said pixels being in a uniform rectilinear array free of said distortion. Please read Carlson, col. 2, lines 63-65; col. 3, lines 4-7 and 47; col. 4, lines 28-33; and

This claim differs from Carlson in that he does not teach a method of generating a composite digital image from at least two source digital images, said method comprising:

- providing a perspective projection of each of said source optical images onto a planar surface of an image sensor, wherein each of said source optical images has a perspective distortion relative to said surface, said perspective distortion being inherent in geometry of said perspective projection onto said surface, said image sensor having a plurality of imaging elements, said imaging elements having a distribution on said surface compensatory for said perspective distortion.
- combining the source digital images without further correction of said perspective distortion to form a composite digital image.

In a similar field of endeavor Hsieh teaches providing a perspective projection of each of said source optical images onto a planar surface of an image sensor (col. 3, line 64 – col. 4, line 1), wherein each of said source optical images has a perspective distortion relative to said surface

(col. 3, line 64 – col. 4, line 3), said perspective distortion being inherent in geometry of said perspective projection onto said surface (col. 3, line 64 – col. 4, line 3), said image sensor having a plurality of imaging elements, said imaging elements having a distribution on said surface compensatory for said perspective distortion (col. 3, line 64 – col. 4, line 40). In light of the teaching of Hsieh, it would have been obvious to one of ordinary skill in the art at the time the invention was made for Carlson to implement a system which corrects perspective distortion in order to permit a predetermined mapping of the image onto the sensor.

In the same field of endeavor, Huang teaches a method of generating a composite digital image from at least two source optical images (page 197, section 3.1, paragraph 1) having perspective distortion relative to a planar surface, said method comprising: (b) combining the source digital images to form a composite digital image (page 200, section 3.5). Additionally, Huang's panoramic stereo imaging system inherently has an imaging sensor because his system includes two cameras for the left-eye and the right-eye (page 197, section 3.1, paragraph 2). This system generates focused images by selecting the correctly focused image for each sensor (pages 197-198, section 3.2, paragraphs 1-2). Please see figs. 5-6 and read pages 199-200, section 3.4, paragraphs 1-2. Similar to Huang, Carlson discloses an imaging system for image warping/ blurring improvements (Carlson, Abstract). In light of the teaching of Huang, it would have been obvious to one of ordinary skill in the art at the time the invention was made for Carlson to provide a method of generating a composite digital image from at least two source digital images in order to provide 360° panoramic stereo images (Huang, section 2, page 197, paragraphs 2-4).

For **claim 24**, Carlson, as modified by Hsieh and Huang, teaches a method further comprising the step of projecting the composite digital image. On pages 204-207, Huang

explains and illustrates the experimental results of the panoramic stereo imaging system. He demonstrates how the image distortion correction of the composite image is projected. In light of the teaching of Huang, it would have been obvious to one of ordinary skill in the art at the time the invention was made for Carlson to provide a method of including a projector for projecting the composite image onto a planar surface in order to provide 360° panoramic stereo images (Huang, section 2, page 197, paragraphs 2-4).

For **claim 25**, Carlson, as modified by Hsieh and Huang, teaches a method wherein the two source digital images overlap in overlapping pixel regions. Huang teaches a method wherein the two source digital images overlap in overlapping pixel regions (Huang, page 207, section 5 – Conclusion). In light of the teaching of Huang, it would have been obvious to one of ordinary skill in the art at the time the invention was made for Carlson to provide a method wherein the two source digital images overlap in overlapping pixel regions in order to provide 360° panoramic stereo images (Huang, section 2, page 197, paragraphs 2-4).

For **claim 26**, Carlson, as modified by Hsieh and Huang, teaches a method wherein said perspective distortion corresponds to a projection of the scene onto a cylinder. In col. 4 lines 28-33, Carlson states that the discrete picture elements 200 are symmetrically disposed about the center of a polar-coordinate spatial distribution pattern. In light of the teaching of Huang, it is well known in the art for coordinates of a cylinder to be known as polar-coordinates. Also, please read Hsieh, col. 3, line 64 – col. 4, line 7 and Huang, pages 199-200, section 3.4, pgphs. 1-2.

For **claim 27**, Carlson, as modified by Hsieh and Huang, teaches a method wherein said perspective distortion corresponds to a projection of the scene onto a sphere. In col. 4 lines 28-33, Carlson states that the discrete picture elements 200 are symmetrically disposed about the

center of a polar-coordinate spatial distribution pattern. In light of the teaching of Huang, it is well known in the art for coordinates of a sphere to be known as polar coordinates. In the disclosure of Huang, 3-D cameras are utilized in the panoramic stereo imaging system. Although he uses a cylindrical surface to describe his panoramic stereo imaging system, Huang makes readers aware of the need for image distortion correction for images at the proper positions of a sphere as well as a cylinder. Also, please read Hsieh col. 3, line 64 – col. 4, line 7.

For **claim 28**, Carlson teaches a method (fig. 1, 100, 110, 108) comprising:

projecting an optical image of a scene on an image sensor having a planar surface (col. 2, line 63 – col. 3, line 7), said optical image having a distortion relative to said planar surface, said image sensor having a plurality of imaging elements (col. 4, lines 13-23), said imaging elements being located according to a non-linear distribution representable by a projection of the scene onto a non-planar surface; Please read Carlson's Abstract, col. 4, lines 24-28, and col. 5, line 14 – col. 6, line 9;

generating a digital image corresponding to said optical image using said image sensor (col. 2, lines 63-65; col. 3, lines 4-7 and 47; col. 4, lines 28-33), said digital image having a plurality of pixels (inherently – CCD; col. 2, line 63 – col. 3, line 7), each said pixel corresponding to a respective one of said imaging elements (col. 4, lines 13-23), said pixels being in a uniform rectilinear array free of said distortion. Please read Carlson's Abstract, col. 4, lines 24-28, and col. 5, line 14 – col. 6, line 9.

This claim differs from Carlson in that he does not teach a method of generating a composite digital image, said method comprising: said optical image having a perspective

distortion relative to said planar surface, said perspective distortion being inherent in geometry of said projecting on said planar surface, said pixels being in a uniform rectilinear array free of said perspective distortion.

In a similar field of endeavor Hsieh teaches that said optical image having a perspective distortion relative to said planar surface (col. 3, line 64 – col. 4, line 1), said perspective distortion being inherent in geometry of said projecting on said planar surface (col. 3, line 64 – col. 4, line 3), said pixels being in a uniform rectilinear array free of said perspective distortion (col. 3, line 64 – col. 4, line 40). In light of the teaching of Hsieh, it would have been obvious to one of ordinary skill in the art at the time the invention was made for Carlson to implement a system which corrects perspective distortion in order to permit a predetermined mapping of the image onto the sensor.

In the same field of endeavor, Huang teaches a method of generating a composite digital image (page 197, section 3.1, paragraph 1), said method comprising: producing an optical image of a scene on an image sensor having a planar surface, said optical image having a perspective distortion relative to said planar surface (page 197, section 3.1, paragraph 1). Additionally, on pages 204-207, Huang explains and illustrates the experimental results of the panoramic stereo imaging system. He demonstrates how the image distortion correction of the composite image is projected on a planar surface. In light of the teaching of Huang, it would have been obvious to one of ordinary skill in the art at the time the invention was made for Carlson to provide a method of generating a composite digital image, said method comprising: producing an optical image of a scene on an image sensor having a planar surface, said optical image having a

perspective distortion relative to said planar surface in order to provide 360° panoramic stereo images (Huang, section 2, page 197, paragraphs 2-4).

For **claim 29**, Carlson, as modified by and Hsieh and Huang, teaches a method wherein said imaging elements are linearly addressed (Carlson, col. 4, lines 13-42).

***Conclusion***

9. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Carramah J. Quiett whose telephone number is (571) 272-7316. The examiner can normally be reached on 8:00-5:00 M-F.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, NgocYen Vu can be reached on (571) 272-7320. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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CJQ
April 24, 2006

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